(c) the three (3) sheets of corrected formal drawings (includes Figures 1-6 and new sequence identifiers SEQ ID NOs. 53-90 in Figures 1-3).

Remarks

Substitute specification:

The Examiner has objected to the specification as originally filed (Item 7) and has requested correction of errors pointed out in the office action. In response to the Examiner's request, Applicant has provided herewith a substitute specification and a marked-up copy of the original specification that details any changes made with this response and changes made in previous responses and amendments. In particular, Applicant has corrected some typographical errors, added references to the sequence listing (e.g., sequences identified in Figures 1-3 and Tables 1-8), and added line numbering. As required, Applicant respectfully submits that this substitute specification contains no new matter.

Applicant notes that the substitute specification differs from the specification that was originally filed for the present application as follows (for page numbers please refer to the **marked up version** of the substitute specification):

page 1: The specification has been updated according to the priority changes that were made with the substitute declarations filed December 13, 2001.

pages 4, 5, 18, 19, and 25-26: The specification has been updated to include sequence identifiers. These sequence identifiers were added in order to comply with the sequence listing requirements of 37 C.F.R. §1.821-1.825.

page 14: The terms "IL 12, IL 16, IL 18, Ifn-ξ" have been replaced with the terms "IL-12, IL-16, IL-18, IFNγ" to correct an obvious clerical error (e.g., see original claim 24 for support).

pages 19 and 22 (Tables 1 and 4): Sequence identifiers (i.e., SEQ ID NOs. 7-29) have been added to identify the sequences in Tables 1 and 4 in order to comply with the sequence listing requirements of 37 C.F.R. §1.821-1.825.

pages 20 and 23 (Tables 2 and 5): Sequence identifiers (i.e., SEQ ID NOs. 30-39) have been added to identify the sequences in Tables 2 and 5 in order to comply with the sequence listing requirements of 37 C.F.R. §1.821-1.825.

pages 20 and 24 (Tables 3 and 6): Sequence identifiers (i.e., SEQ ID NOs. 40-43) have been added to identify the sequences in Tables 3 and 6 in order to comply with the sequence listing requirements of 37 C.F.R. §1.821-1.825.

page 24 (Table 7): Sequence identifiers (i.e., SEQ ID NOs. 44-47) have been added to identify the sequences in Table 7 in order to comply with the sequence listing requirements of 37 C.F.R. §1.821-1.825.

page 27 (Table 8): Sequence identifiers (i.e., SEQ ID NOs. 48-52) have been added to identify the sequences in Table 8 in order to comply with the sequence listing requirements of 37 C.F.R. §1.821-1.825.

pages 29-34: Original claims 1-36 have been **cancelled**.

pages 34-38: New claims 37-67 have been **added**.

Drawings:

The Draftsperson has objected to the drawings as originally filed (Item 5). In response, Applicant has provided herewith a corrected version of the formal drawings that were filed December 28, 2000. Also filed herewith is a marked-up copy of these formal drawings that details any changes made with this response. More specifically, in this response Applicant has added references to the sequence listing in Figures 1-3 (i.e., SEQ ID NOs. 53-90). As required, Applicant submits that these corrected formal drawings contain no new matter.

Substitute sequence listing:

The substitute sequence listing that is filed herewith is necessary since the sequence listing that was filed May 23, 2000 lacks SEQ ID NOs. 7-90. These sequences were present in the original specification (see Figures 1-3 and Tables 1-8) and have been properly identified in the substitute specification and corrected formal drawings that are filed herewith.

Information disclosure statement:

The Examiner has refused to consider the references that were submitted in an information disclosure statement (IDS) on May 11, 2000 (Item 6). The Examiner states that the references were not considered because Applicant failed to supply the references. Applicant respectfully notes that in accordance with 37 C.F.R. § 1.98(d) the IDS that was filed on May 11, 2000 clearly stated that the cited references were either (a) submitted in an application to which the present application claims priority under 35 U.S.C. § 120 or (b) enclosed. However, despite this and in order to expedite prosecution of the present application, Applicant has re-submitted these references in a supplemental IDS that was filed on September 5, 2002. Applicant notes that in accordance with 37 C.F.R. § 1.98(d), copies of the cited references were *not* included with this supplemental IDS since they have already been submitted along with a supplemental IDS that was recently filed in parent case U.S. Serial No. 09/141,220 (hand delivered to Examiner Huynh on August 26, 2002). Applicant respectfully requests that these and all newly cited references be considered by the Examiner.

Claim rejections:

Claims 30-32 were examined in the office action. Claims 1-29 and 33-36 were withdrawn as being drawn to non-elected inventions. The present amendment cancels claims 1-36 and adds claims 37-67 that are drawn to the elected invention. Applicant specifically reserves the right to pursue the subject matter of the canceled claims in a related application; the present Amendment is introduced for the *sole* purpose of focusing the issues of this particular application and speeding its progress toward allowance. Applicant notes that claims 37-67 are derived from original claims 30-31. In particular, claims 37-46 and 56-61 relate to nucleotide molecules that encode modified *food* allergens; and claims 47-55 and 62-67 relate to nucleotide molecules that encode modified *peanut* allergens. Support for these new claims can be found throughout the application as filed. Applicant respectfully requests reexamination and reconsideration of the present case, as amended. For the Examiner's convenience, attached is an **Appendix 2** showing all pending claims remaining in this application after entrance of the present amendment.

Rejection for lack of definiteness:

The Examiner rejects claims 31 and 32 under 35 U.S.C. § 112, second paragraph for lacking definiteness. Applicant respectfully traverses these rejections.

With respect to claim 31, the Examiner states that the recitation of "a recombinant host" is ambiguous and indefinite. For guidance, the Examiner points to the language on page 11, lines 15-17 of the original specification, namely to the use of the terms "host cell". Claim 31 has been cancelled and replaced with new claims 39 and 44. In accordance with the Examiner's suggestion, these new claims include the terms "host cell" instead of "a recombinant host".

With respect to claim 32, the Examiner states that the recitation of "a nucleotide molecule for causing a site specific mutation in a gene encoding a protein which yields a modified allergen" is ambiguous and indefinite since it is not defined in the specification. Claim 32 has been cancelled and none of the new claims include such language. Accordingly, the rejection is moot. Nonetheless, Applicant respectfully disagrees with the Examiner's position and submits that the language in original claim 32 is *not* ambiguous and indefinite. Indeed, one of ordinary skill in the art would readily recognize that the language in original claim 32 refers to nucleotide primers for use in PCR-based site-directed mutagenesis. PCR-based site-directed mutagenesis was and remains a standard technique for generating specifically mutated nucleotide molecules based on a known nucleotide sequence. Furthermore, one of ordinary skill in the art would readily recognize that at the time the invention was made, the design and preparation of suitable primers was trivial as long as both the unmodified nucleotide sequence and mutation site were known.

Rejection for lack of enablement:

The Examiner rejects claims 30-32 under 35 U.S.C. § 112, first paragraph for lacking enablement. More specifically, the Examiner states that the specification of the present application does not enable one of ordinary skill in the art to make and use the invention commensurate in scope with claims 30-32. In particular, the Examiner states that there is

insufficient enablement for claims to *any* nucleotide molecule encoding *any* allergen modified according to the present invention. In supporting this rejection, the Examiner cites *In re Wands* (858 F2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988)) and lists the scope of the claim, the amount of direction and guidance provided, the lack of sufficient working examples, the unpredictability in the art and the amount of experimentation as particularly relevant to his rejection.

Applicant disagrees with the Examiner and submits that claims 30-32 (and new claims 37-67 that are related to original claims 30-31) are fully enabled by the specification of the present application.

As acknowledged by the Examiner, the present specification provides explicit exemplification of nucleotide molecules that encode modified peanut allergens. The specification demonstrates that the modified peanut allergens have reduced IgE binding. Thus, the specification teaches that it is possible to prepare a nucleotide molecule that encodes a modified protein allergen with reduced IgE binding, provides successful evidence of such preparation, and gives precise guidance for how to accomplish the preparation. While it is true that the examples presented in the specification relate to peanut allergens, the specification clearly states that its teachings are applicable to other protein allergens. Those of ordinary skill in the art, having read the present specification, would not require undue experimentation to prepare other nucleotide molecules that encode modified protein allergens with reduced IgE binding.

The situation in the present case is similar to that described in *In re Wands* (858 F2d 731, (Fed. Cir. 1988)), one of the seminal cases on the enablement standard. In *Wands*, the issue was whether the Wands specification was enabling of claims to *any* antibody having a certain affinity for hepatitis B surface allergen, given that the specification provided examples of only three antibodies. The Court held that the description in the Wands specification was sufficient because, even though many difficult experimental steps (i.e., immunization of animals, isolation of lymphocytes from fused animals, fusion of isolated lymphocytes with myeloma cells, screening of hybridomas to identify those that make appropriate antibodies, and isolation of such antibodies) are required, those of ordinary skill in the monoclonal art expect to undertake many

such steps and "are prepared to screen negative hybridomas in order to find one that makes a desired antibody" (8 USPQ2d 1400, 1407). In essence, once *Wands* demonstrated that high affinity antibodies *could* be obtained, those of ordinary skill in the art could turn the experimental crank with a reasonable expectation that they too would be able to isolate such antibodies.

Similarly, in this case, the inventors have demonstrated that a nucleotide molecule that encodes a modified protein allergen with reduced IgE binding *can* be prepared. Those of ordinary skill in the art can now perform the necessary steps (e.g., use patient sera to identify IgE binding epitopes in a protein allergen; mutate the sequence of a nucleotide molecule that encodes the protein to alter identified IgE binding epitopes; express the modified nucleotide molecules in a host cell; and screen modified proteins to identify those with reduced binding) with a reasonable expectation that they too will be able to obtain nucleotide molecules that encode appropriately modified protein allergens. There is no particular magic in the nucleotide or amino acid sequence of a peanut allergen that makes peanut allergens more susceptible to mutation; the inventive principles, as discussed in the present application, apply to other protein allergens as well. In fact, quite the opposite might be expected. Peanut proteins are highly allergenic and like many other food allergens (as distinguished, for example from most pollen, dander, and dust mite allergens) present a significant risk of anaphylaxis to those allergic to them. The inventive demonstration that such anaphylactic food allergen proteins can be modified so that IgE binding is reduced as compared with unmodified protein provides a strong teaching to those of ordinary skill in the art that other nucleotide molecules encoding appropriately modified protein allergens can also be made.

During an interview held on June 19, 2002 between Applicant's representatives, Drs. Brenda Jarrell and Charles Lyon, and Examiners Huynh and Chan, the Examiners indicated that they would be willing to consider evidence in support of Applicant's enablement argument. In particular, they indicated that they would consider post-art references that showed that the methods taught in the present application have been successfully applied to non-peanut allergens.

Accordingly, Applicant has collected a series of references that show that when people of ordinary skill in the art followed the steps that were taught in the present application (i.e., used patient sera to identify IgE binding epitopes; prepared mutated nucleotide molecules that encoded allergens with modifications in the identified IgE binding epitopes; expressed these mutated nucleotides to produce modified allergens; and screened these modified allergens to identify those with reduced binding) they were able to identify, prepare, and use nucleotide molecules that lie within the scope of the pending claims. More specifically, the following post-art references are attached to this response as Exhibits A-D:

A. English walnut allergen – *Jug r* 1

Robotham *et al.*, "Linear IgE epitope mapping of the English walnut (*Juglans regia*) major food allergen, *Jug r* 1", *J. Allergy Clin. Immunol.* 109:143-149, 2002.

B. Potato allergen – *Sol t* 1 (Patatin)

Astwood *et al.*, "Identification and characterization of IgE binding epitopes of patatin, a major food allergen of potato", *J. Allergy Clin. Immunol.* 105:S184 (Abstract 555), 2000.

C. Soybean allergen – P34/Gly m Bd 30K

Helm *et al.*, "Mutational analysis of the IgE-binding epitopes of P34/Gly m Bd 30K", *J. Allergy Clin. Immunol.* 105:378-384, 2000.

D. Shrimp allergen – *Pen a* 1 (Tropomyosin)

Ayuso *et al.*, "Identification and mutational analysis of major epitopes of the shrimp allergen *Pen a* 1 (Tropomyosin)", *J. Allergy Clin. Immunol.* 105:S140 (Abstract 423), 2000; and Lehrer *et al.*, "Current understanding of food allergens", *Ann. N.Y. Acad. Sci.* 964:69-85, 2002.

Applicant respectfully submits that this evidence confirms that there is no particular magic in the sequence of peanut allergens that makes these allergens more susceptible to mutation; the inventive principles, once demonstrated may be readily applied to other protein allergens and the nucleotide molecules that encode them.

Rejection for lack of written description:

The Examiner rejects claims 30-32 under 35 U.S.C. § 112, first paragraph for lacking written description. In particular, the Examiner states that the present application does not describe the invention in such a way as to reasonable convey to one of ordinary skill in the art that, at the time that the application was filed, the inventor had possession of *any* nucleotide molecule encoding *any* protein allergen modified according to the present invention. In supporting this rejection, the Examiner cites *University of California v. Eli Lilly and Co.* (119 F3d 1559, 43 USPQ2d 1398 (Fed. Cir. 1997)).

Applicant respectfully traverses this rejection. Claims 30-32 have been cancelled and new claim 37 recites a nucleotide molecule that encodes a modified food allergen whose amino acid sequence is:

(a) substantially identical to that of an unmodified food allergen except that

(b) at least one amino acid has been modified in at least one IgE epitope so that

(c) IgE binding to the modified food allergen is reduced as compared with IgE binding to the unmodified food allergen.

As acknowledged by the Examiner, the present specification provides sufficient written description for claims to nucleotide molecules that encode modified *peanut* allergens within these limitations. However, the Examiner has apparently taken the position that, because the specification does not *explicitly recite* the nucleotide *sequence* of any protein allergen (modified or otherwise) other than a peanut allergen, the specification does not describe nucleotide molecules that encode modified non-peanut allergens in such a way that one of ordinary skill in the art would have appreciated that the inventors had *possession* of it. This position is untenable.

Applicant appreciates that certain court decisions, including *U.C. Regents* have been interpreted to stand for the proposition that, in certain cases, nucleotide or protein molecules cannot be properly described in a patent specification without explicit recitation of sequence information. However, this is not such a case. It is important to note that a determination of whether the written description requirement is satisfied requires reading the disclosure in light of the knowledge possessed by those skilled in the art *at the time that the invention was filed* (*In re*

Alton, 76 F3d 1168, 37 USPQ 2d 1578 (Fed. Cir. 1996)). In *U.C. Regents*, the patent applications in issue were filed in 1977 and 1979. These applications therefore predated the molecular biology revolution, during which reliable strategies for determining nucleic acid sequences, altering them by PCR-based site-directed mutagenesis, and expressing the generated nucleic acids became routine. As a result of these developments, workers of ordinary skill now require much less *explicit* sequence information to establish possession of a given nucleic acid or protein. The present application was filed on January 28, 2000; its earliest priority date is in 1996, almost twenty years after the applications at issue in *U.C. Regents*. The intervening developments in nucleic acid characterization and manipulation were part of the common knowledge of a person of ordinary skill in the at the time the present application was filed. In the context of such knowledge, the present application provides more than enough description of modified protein allergens and their nucleotides to demonstrate that the inventors were in possession of the full scope of the now claimed invention.

For example, the specification itself clearly states that its teachings are applicable to other unmodified food allergens. Moreover, the specification also provides thorough written description of:

(a) references that list known amino acid sequences, nucleotide sequences, and IgE epitopes for a wide variety of unmodified food allergens, e.g., allergens from cow milk, egg, codfish, hazel nut, soybean, and shrimp (e.g., pages 7-8);

(b) methods for identifying IgE binding sites in a selected protein allergen if they are unknown (e.g., see pages 9-11), coupled with a demonstration that the described strategies are successful when applied to challenging with peanut allergens (e.g., see Examples); and

(c) disruption of identified IgE epitopes, coupled with a demonstration that the described strategies are successful when applied to challenging with peanut allergens (e.g., see Examples).

These teachings provide more than adequate written description to support the present claims. The rejection for lack of written description should be removed.

Rejection for lack of novelty over Wiedemann:

The Examiner rejects claims 30-32 under 35 U.S.C. § 102(b) as being anticipated by Wiedemann et al., *J. Biol. Chem.* 271(47):29915-29921, 1996 ("Wiedemann"). More specifically, the Examiner states that Wiedemann teaches nucleic acid sequences that encode modified allergens such as modified birch pollen allergens that are less reactive with IgE. The Examiner further states that the modified allergens have at least one amino acid substitution. In supporting these statements, the Examiner points to column 1, page 29916 and to the mutants that are described in Figure 8 of Wiedemann.

Claims 30-32 have been cancelled, accordingly these rejections are moot. Applicant further submits that new claims 37-67 are not anticipated by Wiedemann since Wiedemann does not teach *every* limitation of these new claims (MPEP §2131). Indeed, Applicant respectfully submits that the nucleotide molecules that are taught by Wiedemann encode modified allergens that do not satisfy at least *four* limitations of claims 37-67, namely:

(1) **that the modified allergen is a modified *food* allergen (or *peanut* allergen)** – Wiedemann teaches a nucleotide that encodes a modified *birch pollen* allergen, namely birch profilin (e.g., see Abstract);

(2) **that the amino acid sequence of the modified allergen is *substantially identical* to that of an unmodified food allergen *except that at least one amino acid has been modified in at least one IgE epitope*** – Wiedemann teaches modified allergens that include an amino acid modification in an *IgG epitope*, namely the so-called 4A6 epitope that includes the 6-amino acid sequence motif PQFKPQ and that is recognized by the monoclonal IgG antibody called 4A6 (e.g., see Abstract, page 29917, column 1, and page 29920, column 1);

(3) **that *IgE binding* to the modified allergen is reduced as compared to the unmodified allergen** – Wiedemann teaches a modified allergen that exhibits reduced *IgG binding* but exhibits binding to serum IgE from a birch profilin

allergic individual at levels that are comparable to those obtained with the unmodified allergen (e.g., see page 29920, column 1 and Figure 8); and

(4) **that the modified epitope is one that is recognized when contacted with *serum IgE from an individual that is allergic to the unmodified allergen*** – as explained earlier with respect to limitation (2), Wiedemann teaches modifications to an epitope that is recognized by a *monoclonal IgG antibody* that consists of an IgG_1 heavy chain and a κ light chain (e.g., see abstract, page 29917, column 1, and page 29920, column 1).

Since the cited reference does not teach every element of claims 37-67, Applicant respectfully submits that a rejection of claims 37-67 under 35 U.S.C. §102(b) would be inappropriate.

Rejection for lack of novelty over the '316 patent:

The Examiner rejects claims 30-31 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,840,316 to Singh et al. ("the '316 patent"). More specifically, the Examiner states that the '316 patent teaches nucleic acid sequences that encode modified allergens such as modified ryegrass pollen allergens which stimulate minimal amounts of IgE binding and activate T cell responses such as T cell proliferation. The Examiner further states that the modified allergens have at least one amino acid substitution within one IgE binding site. In supporting these statements, the Examiner points to lines 61-67, column 14 and Table 3 of the '316 patent.

Claims 30-31 have been cancelled accordingly these rejections are moot. Applicant further submits that new claims 37-67 are not anticipated by the '316 patent since the '316 patent does not teach *every* limitation of these new claims (MPEP §2131). Indeed, Applicant respectfully submits that the nucleotide molecules that are taught by the '316 patent encode modified allergens that do not satisfy at least *three* limitations of claims 37-67, specifically:

(1) **that the claimed nucleotide molecule encodes a modified *food* allergen (or *peanut* allergen)** – the '316 patent teaches a nucleotide that encodes a modified *ryegrass pollen* allergen, namely *Lol p* Ib family members (e.g., see Abstract);

(2) **that the amino acid sequence of the modified allergen is *substantially identical* to that of an unmodified food allergen *except that at least one amino acid has been modified in at least one IgE epitope*** – as pointed out by the Examiner, the '316 patent teaches modified allergens (e.g., see lines 59-65, column 7 and line 23, column 14 to line 8, column 15); however, Applicant respectfully submits that there is no teaching or suggestion in the '316 patent that these modified allergens should include modifications *within an IgE epitope*. In fact, the only amino acid modification that is specifically discussed in the '316 patent involves the substitution of cysteine residues to minimize dimerization via disulfide linkages (see line 61-64, column 14). Applicant further acknowledges that the '316 patent discusses some nucleotide molecules that encode modified allergens with reduced IgE binding (e.g., Table 1, Example 5, and Example 10). However, Applicant notes that in each case, the modified allergens that are encoded by these nucleotide molecules are simply *fragments* of unmodified allergens. Accordingly, by definition these nucleotide molecules do *not* encode a modified allergen with *an amino acid sequence that is substantially identical to that of an unmodified food allergen except that at least one amino acid has been modified in at least one IgE epitope*.

(3) **that the modified IgE epitope is one that is recognized when contacted with *serum IgE from an individual that is allergic to the unmodified allergen*** – as explained earlier with respect to limitation (2), the '316 patent does not teach or suggest modifying *any* IgE epitope let alone an IgE epitope that is recognized when contacted with serum IgE from an individual that is allergic to the unmodified allergen.

Since the cited reference does not teach every element of claims 37-67, Applicant respectfully submits that a rejection of claims 37-67 under 35 U.S.C. §102(b) would be inappropriate.

Rejection for lack of novelty over Nishiyama:

The Examiner rejects claims 30-31 under 35 U.S.C. § 102(b) as being anticipated by Nishiyama et al., *Molecular Immunology* 32:1021-1029, 1995 ("Nishiyama"). More specifically, the Examiner states that Nishiyama teaches a nucleotide molecule that encodes a modified allergen such as *Der f* 2 that includes various single amino acid substitutions and exhibits reduced IgE binding. In supporting this statement, the Examiner points to column 2 of page 1023 and to Figure 1 of Nishiyama.

Claims 30-32 have been cancelled accordingly these rejections are moot. Applicant further submits that new claims 37-67 are not anticipated by Nishiyama since Nishiyama does not teach *every* limitation of these new claims (MPEP §2131). Indeed, while claims 37-67 relate to modified *food* allergens, the teachings of Nishiyama relate to modified *dust mite* allergens (e.g., see columns 1-2, page 1021).

Applicant further notes that not only are the present claims *novel* over Nishiyama, they are also *not obvious* over Nishiyama. First, the teachings of Nishiyama would not motivate a person having ordinary skill in the art to mutagenize food allergen proteins, or indeed any protein allergen other than dust mite allergens. Nishiyama et al. initiated their work because other attempts to identify IgE binding sites in dust mite allergens *had failed.* The Nishiyama reference addresses only dust mite allergens and a particular problem encountered with them; one of ordinary skill in the art would not be motivated to apply these teachings in other contexts.

Furthermore, even if one of ordinary skill in the art had been motivated to apply the teachings of Nishiyama to non-dust mite allergens, the teachings of Nishiyama would not provide him or her with a reasonable expectation of success of preparing mutant nucleic acid molecules encoding altered allergens with reduced IgE binding for non-dust mite allergens. There would certainly be no reasonable expectation of success for anaphylactic allergens such as food allergens. Dust mite allergens are inhaled allergens that generally cause limited symptoms; food allergens are encountered orally and often cause anaphylactic reactions. A demonstration that IgE binding can be reduced to a dust mite allergen cannot provide any basis to expect that the same result could be achieved for a much more potent allergen that is encountered by a

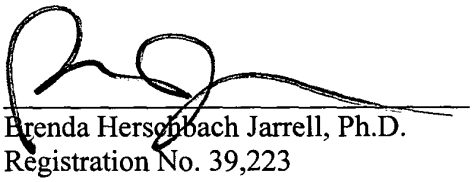
different route. By contrast, the present inventors have demonstrated that it is possible to prepare mutant peanut allergens (and nucleotide molecules that encode them) with reduced IgE binding. Reactions to peanut allergens are often among the most dramatic ever observed; if it is possible to reduce IgE binding to peanut allergens, one can reasonably expect that it is possible with other food allergens and that the strategy used for peanut allergens will prove effective again.

Since the cited reference does not teach every element of claims 37-67, or provide a motivation to apply the teachings to food allergens, and/or provide a reasonable expectation that such an application would succeed, Applicant respectfully submits that a rejection of claims 37-67 under 35 U.S.C. §102 or 103 would be inappropriate.

Conclusion

Based on the arguments presented above, it is submitted that the pending claims, as amended herein, are allowable. If it is believed that a telephone conversation would help expedite prosecution of this case, or if any further information is required, the Examiner is invited to contact the undersigned at (617) 248-5175. Additionally, please charge any fees that may be required, or credit any overpayment, to our Deposit Account No. 03-1721.

Respectfully submitted,



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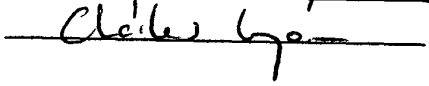

Appendix 1 - Version with markings to show changes made

Please refer to the **marked up version** of the substitute specification that is filed herewith.

Appendix 2- Claims pending after entrance of present amendment

37. A nucleotide molecule encoding a modified food allergen whose amino acid sequence is substantially identical to that of an unmodified food allergen except that at least one amino acid has been modified in at least one IgE epitope so that IgE binding to the modified food allergen is reduced as compared with IgE binding to the unmodified food allergen, the at least one IgE epitope being one that is recognized when the unmodified food allergen is contacted with serum IgE from an individual that is allergic to the unmodified food allergen.

38. The nucleotide molecule of claim 37 wherein at least one amino acid has been modified in all the IgE epitopes of the unmodified food allergen.

39. The nucleotide molecule of claim 37 wherein the at least one IgE epitope is one that is recognized when the unmodified food allergen is contacted with a pool of sera IgE taken from a group of at least two individuals that are allergic to the unmodified food allergen.

40. The nucleotide molecule of claim 37 wherein at least one modified amino acid is located in the center of the at least one IgE epitope.

41. The nucleotide molecule of claim 37 wherein at least one amino acid in the at least one IgE epitope of the unmodified food allergen has been modified by substitution.

42. The nucleotide molecule of claim 41 wherein at least one hydrophobic amino acid in the at least one IgE epitope of the unmodified food allergen has been substituted by a neutral or hydrophilic amino acid.

43. The nucleotide molecule of claim 37 wherein the modified food allergen activates T cells.

44. The nucleotide molecule of claim 37 in a vector for expression in a host cell.

45. The nucleotide molecule of claim 37 wherein the modified food allergen is based on a protein obtained from a source selected from the group consisting of legumes, milks, grains, eggs, fish, crustaceans, and mollusks.

46. The nucleotide molecule of claim 45 wherein the modified food allergen is based on a protein obtained from a source selected from the group consisting of wheat, barley, cow milk, egg, codfish, hazel nut, soybean, and shrimp.

47. A nucleotide molecule encoding a modified peanut allergen whose amino acid sequence is substantially identical to that of an unmodified peanut allergen except that at least one amino acid has been modified in at least one IgE epitope so that IgE binding to the modified peanut allergen is reduced as compared with IgE binding to the unmodified peanut allergen, the at least one IgE epitope being one that is recognized when the unmodified peanut allergen is contacted with serum IgE from an individual that is allergic to the unmodified peanut allergen.

48. The nucleotide molecule of claim 47 wherein at least one amino acid has been modified in all the IgE epitopes of the unmodified peanut allergen.

49. The nucleotide molecule of claim 47 wherein the at least one IgE epitope is one that is recognized when the unmodified peanut allergen is contacted with a pool of sera IgE taken from a group of at least two individuals that are allergic to the unmodified peanut allergen.

50. The nucleotide molecule of claim 47 wherein at least one modified amino acid is located in the center of the at least one IgE epitope.

51. The nucleotide molecule of claim 47 wherein at least one amino acid in the at least one IgE epitope of the unmodified peanut allergen has been modified by substitution.

52. The nucleotide molecule of claim 51 wherein at least one hydrophobic amino acid in the at least one IgE epitope of the unmodified peanut allergen has been substituted by a neutral or hydrophilic amino acid.

53. The nucleotide molecule of claim 47 wherein the modified peanut allergen activates T cells.

54. The nucleotide molecule of claim 47 in a vector for expression in a host cell.

55. The nucleotide molecule of claim 47 wherein the modified peanut allergen is based on a protein selected from the group consisting of Ara h 1, Ara h 2, and Ara h 3.

56. The nucleotide molecule of claim 37, wherein 1-6 amino acid residues have been modified in the at least one IgE epitope.

57. The nucleotide molecule of claim 37, wherein 1-5 amino acid residues have been modified in the at least one IgE epitope.

58. The nucleotide molecule of claim 37, wherein 1-4 amino acid residues have been modified in the at least one IgE epitope.

59. The nucleotide molecule of claim 37, wherein 1-3 amino acid residues have been modified in the at least one IgE epitope.

60. The nucleotide molecule of claim 37, wherein 1-2 amino acid residues have been modified in the at least one IgE epitope.

61. The nucleotide molecule of claim 37, wherein 1 amino acid residue has been modified in the at least one IgE epitope.

62. The nucleotide molecule of claim 47, wherein 1-6 amino acid residues have been modified in the at least one IgE epitope.

63. The nucleotide molecule of claim 47, wherein 1-5 amino acid residues have been modified in the at least one IgE epitope.

64. The nucleotide molecule of claim 47, wherein 1-4 amino acid residues have been modified in the at least one IgE epitope.

65. The nucleotide molecule of claim 47, wherein 1-3 amino acid residues have been modified in the at least one IgE epitope.

66. The nucleotide molecule of claim 47, wherein 1-2 amino acid residues have been modified in the at least one IgE epitope.

67. The nucleotide molecule of claim 47, wherein 1 amino acid residue has been modified in the at least one IgE epitope.